

REMARKS

The Examiner is thanked for the clearly stated action. This communication is filed in response to the Office Action having a mailing date of August 4, 2008, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire November 4, 2008. Sixteen (16) claims, including two (2) independent claims, were paid for in the application. Claims 1-8 and 10-16 are currently amended. No new matter has been added to the application, and all claims are believed in condition for allowance. No fee for additional claims is due by way of this Amendment. The Director is authorized to charge additional fees due by way of this Amendment only, or credit any overpayment, to our Deposit Account No. 19-1090. Upon entry of the amendments herewith, claims 1- 16 remain pending.

I. Objections under 37 CFR 1.75(a)

The Examiner has identified several areas of the claim text where clarification has been requested. The clarifications suggested by the Examiner have been made as follows:

Claim 1 has been amended to recite the “first video image” in accordance with the suggestion of the Examiner. Dependent claims 7, 8, and 10 have been similarly amended.

Claim 3 has been amended to recite “processing another pixel” and “said second video image” in accordance with the suggestions of the Examiner.

Regarding claim 15, the Examiner has suggested that “processing a second, subsequent image” is unclear. As found in the specification, for example at Page 6, lines 16-26, consecutive images are acquired by an acquisition block. The acquired images, Img_1 , Img_2 , Img_3 , ..., Img_{n-1} , Img_n , Img_{n+1} , are processed in the temporal order in which they were acquired. Accordingly, a “second, subsequent image” includes, *inter alia*, a second image acquired temporally after (*i.e.*, subsequent to) a first image. Nevertheless, in order to move the case toward allowance, claim 15 has been further amended to recite “processing a second, subsequent image after processing the first image.” (emphasis added).

In addition to the amendments listed above, several other clarifying amendments have been made to the claims. Proper antecedent basis is now clearly present. In light of the

amendments to claims 1, 3, 7, 8, and 10, and in further light of the additional clarifications to the claims, withdrawal of the 37 CFR 1.75(a) objections is requested.

II. Rejections under 35 USC § 101

The Examiner has indicated that claim 13 is directed to non-statutory subject matter. As suggested by the Examiner, claim 13 has been amended to recite a “computer readable memory programmed to direct a filter...” Accordingly, a request is made to withdraw the rejection to claim 13.

The Examiner has further indicated that claim 14 is directed to non-statutory subject matter. This indication draws strong disagreement. The acquisition device of claim 14, which comprises a statutory tangible “sensor,” provides sufficient machine and article of manufacture structure to satisfy 35 USC § 101. Indeed, the specification clearly illustrates various embodiments of a sensor on Page 4, lines 11-19, which include a CCD sensor and CMOS sensor. Nevertheless, claim 14 has been further amended into a more traditional form of apparatus claim such that the case may be advanced to allowance. Accordingly, a request is made to withdraw the rejection to claim 14.

III. Rejections under 35 U.S.C. § 103

At sections 6-12 of the Office Action (pages 5-22), claims 1-16 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable. Particularly, claims 1, 13, and 14 were rejected as unpatentable over *Kalevo et al.*, “Noise Reduction Techniques for Bayer-Matrix Images” Sensors and Camera Systems for Scientific, Industrial and Digital Photography, pages 348-359, hereinafter *Kalevo* in combination with *Acharya*, (U.S. Pat. 6,091,851), hereinafter *Acharya*. Claims 2-6 were rejected as unpatentable over *Kalevo* in combination with *Acharya* and in further view of *Gindele et al.*, (U.S. Pat. Appl. 2003/0095717 A1), hereinafter *Gindele*. Claims 7-10 and 12 were rejected as unpatentable over *Kalevo* in combination with *Acharya* and in further view of *Heimbürger et al.*, (U.S. Pat. 5,490,094), hereinafter *Heimbürger*. Claim 11 was rejected as unpatentable over *Kalevo* in combination with *Acharya* and in further view of *Heckman*, (U.S. Pat. Appl. 2002/0164063 A1), hereinafter *Heckman*. Claim 15 was rejected as

unpatentable over *Kalevo* in combination with *Garakani et al.*, (U.S. Pat. 6,240,208), hereinafter *Garakani*. Claim 16 was rejected as unpatentable over *Kalevo* in combination with *Garakani* and in further view of *Astle*, (U.S. Pat. 5,751,861), herinafter *Astle*.

Respectful disagreement is made with the above rejections. It is believed that the present independent claims, which have been amended to expedite the application toward allowance, are clearly patentable and that all dependent claims are also patentable.

a. Claims 1, 13, and 14

i. ***Kalevo* does not disclose a sequence of digital images**

Amended claim 1 is allowable for a number of reasons. Embodiments of the invention of claim 1 process plural images, not merely a single image. That is, according to claim 1, a first video image is processed to produce an improved video image. Then, a second video image is digitally filtered using some pixels from the improved video image and some pixels from the second video image. In contrast, each of the cited references only processes pixels of a single video image. None of the cited references use pixels from plural video images.

In more detail, *Kalevo* does not disclose, teach, or suggest the feature of a “filtering the noise of a sequence of digital images.” Instead, as stated in *Kalevo*’s abstract, *Kalevo* merely compares different Noise Reduction (NR) techniques for processing a single image. The NR techniques are performed on four separate, high-quality digital images, which *Kalevo* identifies as “Gray,” “Plant,” “Tiger,” and “Docu.” In his paper, *Kalevo* artificially adds a random noise to the four high-quality images and creates four corresponding low-quality images. Next, *Kalevo* processes the low-quality images with each of the several NR techniques. *Kalevo* then evaluates each of the resulting filtered images with respect to the original, corresponding high-quality images. By evaluating the filtered images, *Kalevo* is able to compare the effectiveness of the NR techniques and recommend a preferred technique.

Three of the NR techniques that *Kalevo* compares are shown in *Kalevo*’s Figure 2. In a first technique, a digital image undergoes NR and then undergoes Color Filter Array Interpolation (CFAI). In a second technique, *Kalevo* processes a digital image with CFAI and

then NR. In a third technique, *Kalevo* processes a digital image with CFAI, then RGB to YUV, then NR. Nowhere in *Kalevo*'s article does *Kalevo* introduce or perform any filtering on a sequence of images as recited in claim 1. Accordingly, *Kalevo* does not disclose, teach, or suggest "filtering the noise of a sequence of digital images."

Another reason that amended claim 1 is allowable over the cited reference is because *Kalevo* does not disclose, teach, or suggest the feature of "carrying out a digital filtering of a first type using pixels from said first set of pixels selected from the second video image and pixels from said second set of pixels selected from the corresponding improved video image to generate the corresponding filtered pixel." As described above, *Kalevo* only performs filtering on a single image. *Kalevo* does not capture and retain first and second video images, so *Kalevo* cannot identify the first and second sets of pixels as required by claim 1. Accordingly, *Kalevo* cannot disclose, teach, or suggest "digital filtering... using pixels forming part of said first set of pixels and part of said second set of pixels."

Still another reason why claim 1 is allowable over the cited reference is because *Kalevo* does not disclose, teach, or suggest the feature of a "carrying out a digital filtering ... to generate the corresponding filtered pixel." During each of the techniques compared, *Kalevo* filters his single image with both CFAI and NR processes; however, *Kalevo*'s filtering is based only on the single image. That is, since *Kalevo* does not process a sequence of images, and since *Kalevo* cannot then select first and second sets of pixels from a sequence of images, *Kalevo* cannot possibly generate the filtered pixel required by claim 1.

ii. **Acharya does not disclose a sequence of digital images**

Amended claim 1 is further allowable. *Acharya* processes every pixel of an image with a repeatable sequence of steps until all pixels in a raw image have been assigned R, G, and B values, and this is not the same or equivalent to "processing at least one pixel of a second video image of the sequence that temporally follows said first video image." Like *Kalevo*, the *Acharya* reference merely processes a single image. *Acharya* does not disclose, teach, or suggest processing a sequence of digital images by cooperatively using pixel information from a second (current) video image and a first (previous) video image. Thus, even

though *Acharya* uses pixels surrounding the targeted pixel (*i.e.*, spatially adjacent pixels), *Acharya* only uses the surrounding pixels of the same image. *Acharya* does not disclose, teach, or suggest using corresponding pixels from different video images.

iii. **Kalevo and Acharya together do not disclose a sequence of digital images**

Claim 1 is further patentable over the combination of *Kalevo* and *Acharya*. Since both *Kalevo* and *Acharya* teach processing of pixels in a single image, there is no reasonable interpretation to suggest that combining the references will teach cooperative processing of pixels from a sequence of images. Even if *Kalevo* and *Acharya* were combined, the resulting device would, at most, process a single image according to the teachings of *Kalevo* or *Acharya*.

For at least the reasons listed herein, amended claim 1 is allowable over *Kalevo*, and claim 1 is allowable over *Acharya*. Further, there is no modification of *Kalevo* alone, with the addition of *Acharya*, or with the addition of any other reference that will produce a device capable of the method of claim 1. Accordingly, claim 1 is believed allowable.

It is further apparent that even though the language of amended claims 13 and 14 is not identical to that of claim 1, the nonobviousness of claims 13 and 14 will be apparent in view of the above remarks. Amended claim 13, which recites, *inter alia*, “a computer readable memory programmed to direct a filter ... in accordance with the method of claim 1,” is believed allowable. Amended claim 14, which recites, “an acquisition device comprising[:] a sensor ... operable ... in accordance with the method of claim 1,” is believed allowable.

b. **Claim 2**

Amended claim 2 recites, *inter alia*, “carrying out a first evaluation of motion.” Neither the *Gindele* reference nor any of the other cited references evaluate motion. *Gindele* addresses the problem of sparsely populated images having missing color values in some pixels. Paragraph [0026] of *Gindele*, which was cited with reference to an evaluation of motion, instead relates to noise reduction (cleaning) of the digital image. More particularly, *Gindele*’s paragraph [0026], and the associated flowchart of Fig. 7, identifies green pixels having a value that exceeds

a given noise threshold and has nothing to do with motion. Accordingly, for at least the reason that none of the cited references disclose, suggest, or teach an evaluation of motion, claim 2 is in condition for allowance.

c. Claim 3

Amended claim 3 is allowable for several reasons. For example, as discussed herein, claim 3 requires analysis of different images from a sequence of images. More particularly, claim 3 recites “selecting a third set of pixels ... of the second video image” and “selecting a fourth set of pixels ... of the improved video image.” The “improved video image” is obtained from “a first video image” recited in base claim 1 and claim 3 positively recites the “second video image.” The *Kalevo* reference does not process a sequence of images. Instead, *Kalevo* merely compares filtering technique results by processing single images. Accordingly, *Kalevo* does not disclose, teach, or suggest the elements of claim 3.

Claim 3 is further allowable because *Kalevo* does not disclose, teach, or suggest “evaluation of motion.” Once again, *Kalevo* neither operates nor informs on a sequence of digital images. Further, nothing in *Kalevo* is relevant to motion evaluation. The cited passage and tables of *Kalevo*, Section 2.4 and Tables 3 and 4, are not related to motion. Instead, the cited *Kalevo* paragraph provides an analysis of the manually generated tables 3 and 4, which were constructed to help evaluate the test results from different filtering algorithms. Thus, claim 3, which includes, *inter alia*, processing of a sequence of digital images and motion evaluation, is further allowable over the cited references.

d. Claim 4

Claim 4 is allowable over the *Kalevo* reference at least because *Kalevo* does not disclose, teach, or suggest the feature of “said first set of pixels and said second set of pixels comprise pixels associated with the same chromatic component of the at least one pixel.” The cited paragraphs of *Kalevo* teach about interpolating color information, but do not at all teach first and second sets of pixels associated with a same chromatic component. Accordingly, claim 4 is allowable over the cited reference.

e. Claim 7

Claim 7 recites, *inter alia*, “a statistical parameter σ_n^{GL} representative of global noise ..., the digital filtering of the first type utilizing said statistical parameter. The *Heimburger* reference calculates local estimates of noise and discusses a global measure of input signal noise (see Abstract), however, even if the global measure of *Heimburger* is a representative of global noise, *Heimburger* cannot use the global measure for digital filtering of first type. As discussed herein, digital filtering of the first type uses pixels from a first video image and a second video image of a sequence of images. Neither *Kalevo*, nor *Acharya*, nor *Heimburger* disclose, teach, or suggest filtering using multiple images. Accordingly, claim 7 is allowable over the cited references.

f. Claim 8

Claim 8, which recites, *inter alia*, “the statistical global noise parameter σ_n^{GL} is obtained from said plurality of local estimates,” is allowable over the *Heimburger* reference. *Heimburger* discusses both local estimates of noise and a “global measure of the input signal noise” (see Abstract), however, *Heimburger* has no disclosure, suggestion, or teaching that his global measure of noise is obtained from the plurality of local estimates. In fact, *Heimburger*’s global noise statistic is only referred to as a global measure, which is calculated in “a noise measurement circuit 20.” See Fig. 1 and Col. 3, lines 66-67. Further, it is the global noise statistic of *Heimburger* that is used to help calculate the local noise estimate, not the other way around. See Col. 3, line 67 – Col. 4, line 5. Accordingly, claim 8 is allowable over *Heimburger*.

g. Claim 11

Claim 11 is allowable over *Kalevo*, *Acharya*, and *Heckman* singly or in any motivated combination. Claim 11 recites, *inter alia*, “a selection phase carried out in accordance with a Duncan Range Test, wherein said digital filtering of the first type utilizes the subset of pixels.” *Heckman* does not disclose, teach, or suggest using a Duncan Range Test (DRT) for selection purposes of pixels, subsets, or anything other than a statistical significance of differences among sample means within particular experiments. Para. [0140].

Further, it is not clear how *Heckman*, which relates to determining a profile of quantitative features for different cells in a sample by collecting and analyzing information on the mass distribution in cells or portions of cells and comparing the collected information to values from a relational database (*see* Abstract) is combinable with *Kalevo* and/or *Acharya*. Accordingly, for at least the reason that *Heckman* fails to disclose, teach, or suggest the elements of claim 11, then claim 11 is in condition for allowance.

h. Claim 15

For at least the reasons that amended claim 1 is allowable over *Kalevo*, amended claim 15 is also allowable. That is, *Kalevo* does not disclose, teach, or suggest using multiple images in a sequence of images. Accordingly, claim 15, which recites “processing a first image” and “processing a second, subsequent image after processing the first image” is in condition for allowance.

The addition of *Garakani* does not cure the deficiencies of *Kalevo*. The *Garakani* reference does describe multiple windows, but as described in Col. 4, lines 31-34, *Garakani*’s windows are merely rectangular subsets of a single image. That is, *Garakani*, like *Kalevo*, is not capable of cooperatively processing pixels from a first image and a second, subsequent image. Accordingly, claim 15 is in condition for allowance.

IV. Dependent Claims in General

Each dependent claim inherits the limitations of its respective base claim and all intervening claims. Therefore, allowance of the respective base claim compels allowance of all dependent claims. See, *e.g.*, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988). Accordingly, all dependent claims, including those that were referenced in the Office Action and not specifically referenced in the present response, are allowable for at least reasons of their respective base claims, and the rejections should be withdrawn.

V. Approval for Submitted References

It is respectfully requested that the Examiner review and initial the Patent and Non-Patent Literature (NPL) Documents filed on form PTO-1449 with the original application, granted the filing date of August 12, 2003. The Examiner considered the references on July 31, 2008 and signed the PTO-1449 form, however, the individual references are not yet initialed. The references include US 6,229,578 to *Acharya et al.* and NPL documents by *Bosco et al.*, *Kalevo et al.*, and *Yan*.

VI. Conclusion

This amendment is made in order to reach agreement on the present claims and have the case advanced to allowance. Overall, the cited references alone, or with the addition of any other cited references in any motivated combination, do not disclose, teach, or suggest what is recited in the independent claims. Thus, given the above remarks, it is respectfully submitted that the presently rejected independent claims are in condition for allowance. The dependent claims that depend directly or indirectly on these independent claims are likewise allowable based on at least the same reasons and based on the recitations contained in each dependent claim.

If a teaching in any of the cited references that is relevant to the allowability of the claims have been overlooked, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact Mr. Satagaj at (206) 622-4900.

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All of the claims remaining in the application are now clearly believed to be allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,
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